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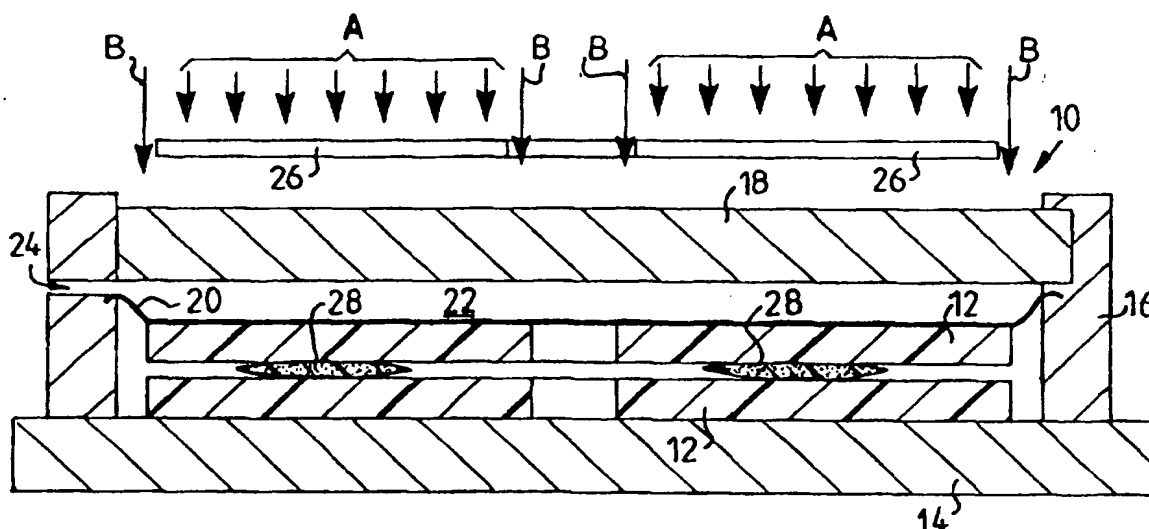
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(54) Title: METHOD AND APPARATUS FOR GLUEING DISC ELEMENTS TOGETHER



(57) Abstract

The invention relates to a method and a device for gluing together disc elements (12). An adhesive (28) is applied between two disc elements (12) and they are pressed together by means of a flexible membrane (20) in a press unit (10). The adhesive layer formed between the disc elements (12) is cured, for example by means of UV light in a press unit via a transparent cover (18) or a transparent bottom plate (14).

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Method and apparatus for glueing disc elements together

The present invention relates to a method for glueing together thin disc elements, especially substrates for digital audio, video or computer discs, such as compact discs or digital video discs.

When producing certain types of data storage discs, for example so-called digital video discs, with one or more layers of information, two substrate sics of polycarbonate with a thickness of 0.6 mm are normally glued together, with the information layer(s) adjacent to the layer of adhesive joining the discs.

For this purpose there has previously been suggested that a method whereby a string of adhesive is applied at the centre of one of the disc substrates, whereafter the other disc substrate is placed concentrically over it and they are together subjected to a rapid rotation whereupon the adhesive is spread radially outwards over the facing surfaces of the disc substrates pulling these together. This process is rapid but requires a great excess of adhesive to function satisfactorily. This method can most closely be characterized as so-called "spincoating" of a protective coating layer of a compact disc, and requires completely flat substrate discs or flat holders during the subsequent curing.

In another suggested method of glueing, the adhesive is applied to one of the discs by means of a printing process, for example screen printing, whereafter the discs are brought together. This method does not waste the adhesive and the application can be carried out very rapidly. However, there is a certain risk that air enclosures will form when the discs are brought together and there is a risk of a risk for breakdown of the printing system should the screen printing blanket rupture.

One purpose of the present invention is to suggest a glueing method which prevents the occurrence of excess adhesive and air enclosures in the adhesive layer between the discs.

5 For this purpose, the process according to the invention is characterized by the following steps:

- a) applying an adhesive to one side of a first disc element,
- b) applying a second disc element centered and aligned with the adhesive coat element,
- 10 c) that the disc elements are pressed together in a press unit, and
- d) that a thin adhesive layer formed by compression between the disc elements is cured.

15 By carefully dosing and applying an adhesive of suitable viscosity, it is possible to avoid the troublesome removal of excess adhesive, and this, in combination with a suitable compression pressure and curing, prevents the occurrence of air enclosures between the disc elements.

20 The curing of the adhesive layer can be effected in the press unit and/or at a location outside it, for example by irradiating the adhesive layer with ultraviolet light.

25 According to a particularly preferred embodiment of the method according to the invention, a radially outer annular edge area of the disc elements, and preferably also a radially inner area of the same, are subjected to UV light during the compression phase of the disc element, whereby the adhesive is immediately cured at the outer and inner peripheral areas, thereby effectively preventing adhesive from leaking out from the gap between the disc elements.

The present invention also relates to a device for glueing together thin disc elements, especially substrates for digital audio, video or computer discs, such as compact discs or digital video discs. The device is characterized by a pressure chamber housing comprising; firstly, a bottom plate supporting one side of the disc elements which are laid centered and coinciding on top of each other, secondly, a flexible pressure membrane, arranged to be able to lie in contact against the other side of the disc elements, thirdly, a cover which, together with the membrane defines a pressure chamber, and fourthly, means for pressurizing the pressure chamber with a pressure medium.

In a suitable embodiment, the cover or the bottom plate is made transparent to permit UV irradiation of the adhesive layer between the disc elements which have been pressed together. This device provides an effectively coordinated glueing together and curing of the disc elements without any problem with excess adhesive and air enclosures.

Additional characteristics of the device according to the invention are disclosed in the dependent claims.

The invention will be described in more detail below with reference to the accompanying drawing in which:

Figure 1 shows schematically a cross-section through a pressing device for glueing together two disc elements according to a first embodiment of the invention, in a phase immediately prior to pressing together; and

Figure 2 shows schematically a second embodiment of the device according to the invention.

In Figure 1, 10 generally designates a pressing unit intended for glueing together two relatively thin (0.6 mm thick) disc substrates 12 of polycarbonate for digital so-called DVDs. The press unit 10 comprises a bottom plate 14, a pressure

chamber wall 16, a cover 18 and a flexible pressure membrane 20 fixed in the wall 16. The cover 18 and the membrane 20 are made transparent for ultraviolet light. Between the cover 18 and the membrane 20 there is defined a pressure chamber 22 designed to be pressurized with compressed air for example via an inlet 24.

The diaphragm or screen 26 for UV light is associated with the press unit 10. It can be integrated with the press unit 10 or with a UV light source (not shown). The diaphragm 26 can provide desired screening off of UV light directed towards the press unit 10 when curing an adhesive layer between the disc substrates 12.

The device in Figure 1 is intended to be used in the following manner.

A well-defined amount of adhesive 28, for example an adhesive of epoxy type, is applied on top of the lower disc substrate 12 in a ring shape, whereafter the upper disc substrate 12 is applied centered over the lower substrate 12. This adhesive application phase can be carried out either in a separate step outside the press unit or in the same. The cover 18 is thereafter put in place and an external compressed air source (not shown) is connected, whereupon compressed air is fed into the pressure chamber 22 via the inlet 24 to exert a suitably adapted pressure on the flexible membrane 20 for the desired compression of the disc substrates 12 so that the adhesive 28 is pressed out towards an outer peripheral edge 30 of the substrates 12 and in towards an inner edge 32 or to an annular groove (not shown) located somewhat radially outwards from said edge 32. This annular groove is normal in CDs. Directly after the compression phase, when a uniform, homogeneous and air enclosure free adhesive layer is formed between the disc substrates 12, the adhesive layer is subjected to UV light via the transparent cover 18 in the membrane 20 as shown by the arrows A in Figure 1 for curing of the adhesive layer. It is, however, an advantage during the compression phase to allow a portion of the adhesive curing UV light to irradiate the outer and inner adhesive layer limiting edge areas 30, 32 of the disc substrates 12, so that the

adhesive layer is thereby rapidly cured at these edge areas to prevent leakage of adhesive when the discs are pressed together. This edge irradiation of the adhesive layer with UV light is indicated with the arrows B in Figure 1 and can be achieved by the diaphragm 26 blocking off further UV light A until the edge areas of the adhesive layer have been cured, whereafter the diaphragm 26 can be opened or removed to UV irradiate the rest of the adhesive layer. The disc substrates 12 can then be removed from the press unit 10 and possibly be after cured in another location if so required. The glueing process can then be repeated.

Figure 2 shows an alternative embodiment of the press unit 10 according to the invention. The difference in principle is only that the bottom plate 12 in this case is transparent and that the UV rays A, B come from below, and the flexible membrane 20 can be made in a material which is not penetrable by UV light, since it is on the side of the disc substrate 12 remote from the UV source. Otherwise the working principle can be identical to that described in connection with Figure 1.

The invention is not limited to the embodiments described above. Rather, it can be varied within the scope of the following claims. For example it is possible within the scope of the invention thanks to the thinness of the disc substrates 12 in combination with an easily flowable, low viscosity adhesive, to get it to flow out to a large extent itself and with the aid of the capillary force to fill out most of the space between the disc substrates, so that only a relatively small compression pressure is required to be exerted by the press unit 10 on the disc substrates 12 and the adhesive.

Claims

1. Method for glueing together thin disc elements (12), especially substrates for digital audio, video or computer discs, such as compact disc or digital video discs, **characterized** by the following steps:

- a) applying an adhesive (28) to one side of a first disc element (12),
- b) applying a second disc element (12) centered and aligned with the adhesive coat element (12),
- c) pressing the disc elements (12) together in a press unit (10), and
- d) curing a thin adhesive layer formed by compression between the disc elements (12).

2. Method according to Claim 1, **characterized** in that the adhesive layer is cured in the press unit (10) by irradiation of the layer by ultraviolet light.

3. Method according to Claim 1 or 2, **characterized** in that a radially outer, annular edge area (30) of the disc elements (12) is irradiated with ultraviolet light during the compression phase of the disc elements.

4. Method according to one of Claims 1-3, **characterized** in that a radially inner area (32) of the disc elements (12) is irradiated with ultraviolet light during the compression phase of the disc elements.

5. Device for glueing together thin disc elements (12), especially substrates for digital audio, video and computer discs, such as compact disc or digital video discs, **characterized** by a pressure chamber housing (10) comprising firstly a bottom plate (14) supporting one side of the disc elements (12) which are laid centered and coinciding on top of each other, secondly a flexible pressure membrane (20), arranged to be able to lie in contact against the other side of the

disc elements (12), thirdly a cover (18) which, together with the membrane (26) defines a pressure chamber (22), and fourthly means (24) for pressurizing the pressure chamber (22) with a pressure medium.

5 6. Device according to Claim 5, **characterized** in that the cover (18), or alternatively the bottom plate (14) is made transparent to permit UV irradiation of the adhesive layer between the disc elements (12) pressed together.

10 7. Device according to Claim 6, in which the cover (18) is UV-transparent, **characterized** in that the membrane (20) is UV-transparent.

8. Device according to one of Claims 1-6, **characterized** in that the membrane (20) is anchored in a side wall (16) of the pressure chamber housing (10).

15 9. Device according to one of Claims 6-8, **characterized** in that that side of the pressure chamber housing (10) which has a transparent cover (18) or alternatively a transparent bottom plate (14) is coordinated with a diaphragm means (14) for bringing off ultraviolet light directed towards the disc elements.

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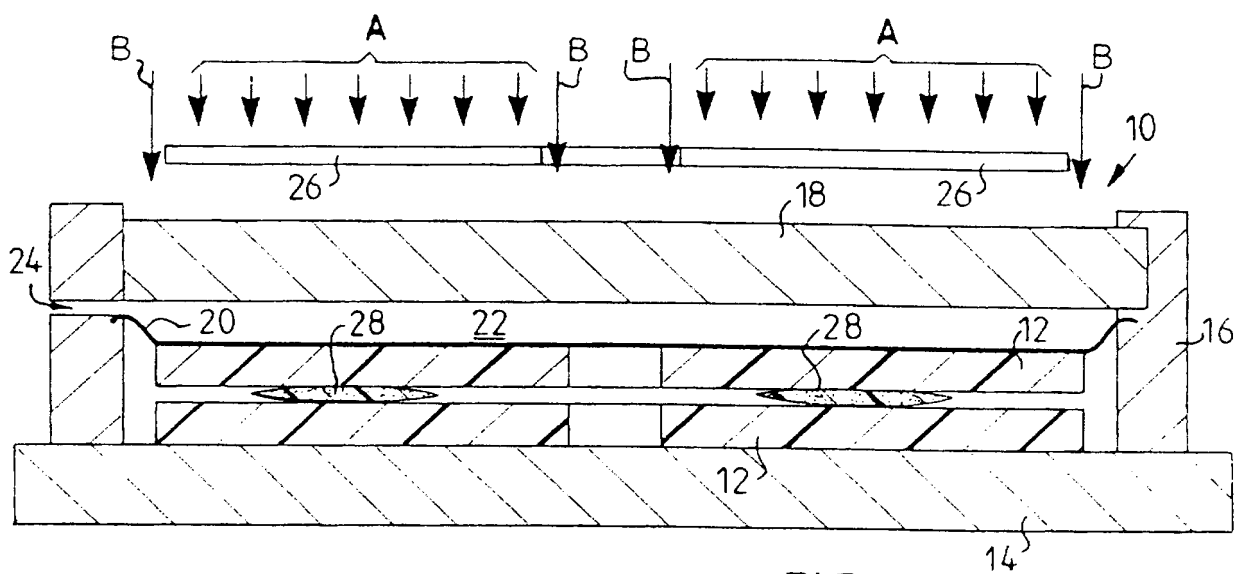


FIG. 1

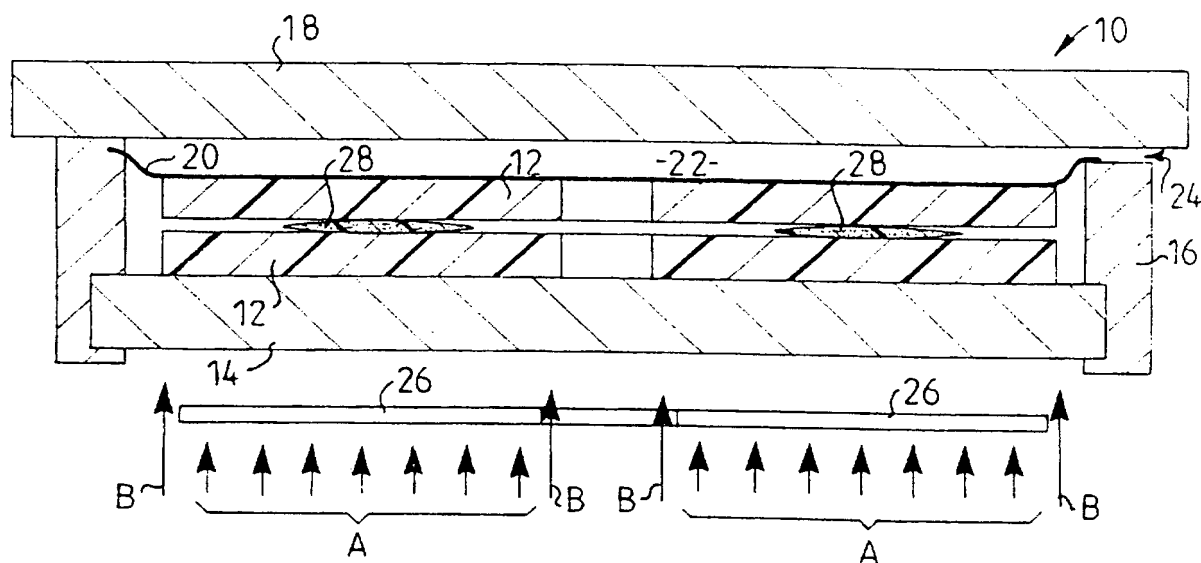


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/00559

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B29D 17/00, G11B 7/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Orbit Search Service, File WPAT, Accession number 86-262103/40, (RICOH KK), J61190738, 86.08.25 (8640) abstract --	1-2
A,P	Orbit Search Service, File WPAT, Accession number 97-170864/16, (PIONEER ELECTRONIC CORP ET AL), JP09035335, 97.02.07 (9716), abstract --	1-2

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A	Orbit Search Service, File WPAT, Accession number 89-342881/47, (MATSUSHITA ELEC IND KK), J01253846, 89.10.11 (8947), abstract -----	1,5